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Notes on Bahaman algae

MARSHALL A. HOWE

(WITH PLATE 6)

A collection of Bahaman algae, mostly marine, secured during the summer of 1903, by Dr. W. C. Coker, of the University of North Carolina, chief of the botanical staff of the Expedition of the Geographical Society of Baltimore to the Bahama Islands,* has been submitted to the writer for determination. This collection includes several rare or novel forms and some of the more interesting have been selected for comment below. Dr. Coker's specimens of algae were all preserved in fluids, either alcohol or solutions of formaldehyde, and they have for this reason proved especially satisfactory for study; though in some cases, as may necessarily happen, the material was less copious than could be desired.

Caulerpa compressa (Web.-v. Bosse).

Caulerpa paspaloides, var. *typica*, f. *compressa* Web.-v. Bosse, Ann. Jard. Bot. Buitenzorg, **15**: 353. *pl. 30. f. 3, 4.* 1898.

In four feet of water, off Clarence Harbor, Long Island, Bahamas, July 16, 1903.

This plant, which agrees closely with Mme. Weber's description and figures, is, we believe, absolutely distinct from *Caulerpa paspaloides* (Bory) Grev. In *C. paspaloides*, the primary pinnules are 3- or 4-ranked, so that the "frond" is distinctly 3- or 4-angled or 3- or 4-winged, a character that is more strikingly apparent in fresh or fluid-preserved material than in dried specimens; the secondary pinnules are pectinately secund along the upper side of the rachis and the lowermost of these secondary pinnules are always much shorter than the rachis itself. In *Caulerpa compressa*, on the other hand, the primary pinnules are so numerous and densely crowded that it is difficult to say how they are arranged, but they are probably 8–12-ranked, and the "frond" is as cylindrical and dense as that of *Dasycladus vermicularis* (Scop.) Krasser; the secondary pinnules are pinnately distichous and corymbose, the lowermost being as long as the rachis or slightly longer; the "pedicel" supporting the four, five, or more digitate primary branches or "fronds" is very short, measuring in Dr. Coker's specimen only 0.5–1.0 cm.

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* For organization of this expedition and outline of its results, see *Science*, II. 18: 427. 2 O 1903.

CAULERPA PASPALOIDES (Bory) Grev.

Green Cay, in 4 fathoms.

RHIPOCEPHALUS PHOENIX (Ell. & Soland.) Kuetz.

Mangrove Cay, Andros, June 26, 1903. Dr. Coker's specimens accord very well with Ellis's original figure* in regard to the outline of the capitulum, but the flabella are broader, more crowded, and more erect. Specimens collected by the writer at Key West, Florida (*no. 1612*, distributed in Phyc. Bor.-Am. as *no. 1030*) are extremely varied as regards the form of the capitulum, only occasionally offering the oblong-ovoid outline figured by Ellis. The capitula of some of these Key West plants are conical, some are broadest near the top, tapering down to the stalk below, and others are much elongated and of uniform width throughout (sometimes 9–10 cm. x 1–1.5 cm.), but these extremes are connected by clearly intermediate forms and we think but one species is represented.

UDOTEA CONGLUTINATA (Ell. & Soland.) Lamour.

Collected by Dr. Coker at several points; at Green Cay in 4 fathoms of water. **Udotea Flabellum** (Ell. & Soland.),† which is much the more common in southern Florida and Porto Rico, does not appear to have been found by Dr. Coker.

MICRODICTYON CRASSUM J. Ag. Anal. Alg. Cont. 1: 107. 1894.

Green Cay, in 4 fathoms. We are using provisionally for these plants collected by Dr. Coker the specific name applied by J. Agardh to specimens from the Bahamas sent to him by Mrs. Curtiss, though it is not yet wholly clear how either are to be kept separate from *Microdictyon umbilicatum* (Velley) Zanard. J. Agardh in proposing *M. crassum* as a new species appears to have been influenced chiefly by the "articulis multo brevioribus quam in aliis speciebus" * * * * "diametro vix longioribus." But the articuli of the original *Conferva umbilicata* as figured by Velley (Trans. Linn. Soc. **5**: *pl. 7.* 1800) are also often "diametro vix longioribus," even though J. Agardh[*] describes the articuli of *Microdictyon umbilicatum* as "circiter 4-plo longioribus." Velley's specimens were from New South Wales, and J. Agardh's remark, "Quae prima vice ad insulas Sandwich detecta fuit *C. umbilicalis*, eandem quoque ad Novam Hollandiam obvenire statuit C. Agardh (*Syst. p. 85*)," seems to indicate that he had seen neither the original plants nor the original description and figures of the first-described species of the genus.

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* Ell. & Soland. Nat. Hist. Zooph. *pl. 25. f. 2.* 1786.

† *Corallina Flabellum* Ell. & Soland. Nat. Hist. Zooph. 124. *pl. 24.* 1786. *Udotea flabellata* Lamour. Hist. Polyp. 311. 1816.

Coccocladus[†] **occidentalis laxus** var. nov.

Fertile plants reaching 7 cm. in height and 10–13 mm. in width, flaccid: sporangia obovoid, oblong-ellipsoidal, or pyriform-subclavate, 460–880 μ × 315–430 μ, often twice as long as broad, lateral or occasionally terminal at the ends of branches of the first three (rarely four) orders: aplanospores for a long time closely coherent in a single peripheral layer surrounding a central cavity, radially elongated, 66–85 μ × 55–72 μ, mostly 1½ times as long as broad, usually angular-obovoid or ellipsoidal. (PLATE 6, FIGURES 1 AND 2.)

In small sink-holes by Big Pond, Nassau, June 23, 1903.

This remarkable plant is so strikingly different from the usual form of *Coccocladus occidentalis* as to suggest at first sight not only a distinct species, but even a different genus, yet in the presence of some apparently intermediate forms from other collections we dare not propose for it a rank higher than that of variety; though it is possible that a fuller knowledge of its life-history would lead to another conclusion. Dr. Coker writes that the plant grows "about one mile inland," in slightly brackish water which responds to the changes of the tide. The lax habit, the elongated sporangia, and extension of the sporangium-bearing capacity to branches of the third (and even the fourth) order are in harmony with the variations which the recent researches of Dr. Livingston * might lead us to expect would occur in a transition from salt to fresh or slightly brackish water. The variety *laxus* is almost destitute of the yellowish staining matter which manifests itself so conspicuously in ordinary specimens of this genus whether dried or preserved in fluids. In all conditions of *Coccocladus*, the sporangia appear to mature almost simultaneously in all parts of a plant, so that a considerable number of fertile individuals is needed to follow out the stages of spore-formation. In Dr. Coker's material of the variety *laxus*, there occur two or three plants with smaller pyriform-obovoid sporangia showing numerous chlorophyl-bodies, but apparently no spores; these we take to be immature aplanosporangia, but in the absence of direct observation of intervening stages the possibility that they represent sporangia of a different sort has suggested itself.

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[*] *l. c.* 105.

[†] COCCOCLADUS Cramer, Neue Denkschr. Schweiz. Naturf. Ges. **30**: —(37). 1887.

Botryophora J. Ag. Till Alg. Syst. 5: 139. 1887. Wille, E. & P. Nat. Pflanzenfam. 1^2: 157. 1891. Not *Botryophora* Bompard, Hedwigia, **6**: 129. 1867. The generic type of *Coccocladus*, as also of J. Agardh's *Botryophora*, is *Dasycladus occidentalis* Harv. Ner. Bor.-Am. **3**: 38. *pl. 41B.* 1858.

Coccocladus occidentalis laxus evidently has a closer affinity with **Coccocladus occidentalis Conquerantii,**† judging from Cramer's description, than with the typical *C. occidentalis*, but, we believe, differs too much from that to bear the same varietal name. The sporangia of *C. occidentalis Conquerantii*, according to Cramer, are at most only slightly ellipsoidal and occur only on branches of the first two orders. The number of spores to a sporangium and the size of the spores, characters which are in part relied upon by Cramer to separate his *Botryophora Conquerantii* from his *B. occidentalis*, appear in a considerable series of specimens of this genus now accessible to be extremely variable and unreliable for a specific separation. And Cramer's selection of a comparatively few-spored form for the typical *C. occidentalis* is hardly justified in view of Harvey's description of the spores as "innumerable," a characterization that is well substantiated by specimens of Harvey's collecting at Key West now in the herbarium of Columbia University, in which the number of spores to a sporangium is 200 or more. The peripheral arrangement of the spores about a central cavity, which Cramer emphasizes as a distinctive character of his *Botryophora Conquerantii*, and which that variety has in common with our variety *laxus*, seems to be more constant than number and size of spores and may be more significant. Specimens agreeing essentially with Cramer's description of *Botryophora Conquerantii* have been collected by the writer at Key West, Florida (*no. 1531*).

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* Livingston, B. E. On the Nature of the Stimulus which causes the Change of Form in Polymorphic Green Algae. Bot. Gaz. 30: 289–317. *pl. 17, 18.* 1900.

——. The Rôle of Diffusion and Osmotic Pressure in Plants. Dec. Publ. Univ. Chicago, II. 8. 1903.

† *Dasycladus Conquerantii* Crouan; Schramm & Mazé, Alg. Guadeloupe, 47 1865. Mazé & Schramm, Alg. Guadeloupe, 108. 1870–77.

Botryophora Conquerantii (Crouan) Cramer, Neue Denkschr. Schweiz. Naturf. Ges. 32: 6. *pl. 4. f. 1.* 1890.

Neomeris Cokeri sp. nov.

Plants subcylindrical or clavate, 7–14 mm. long, 1.5–2.5 mm. thick, dark green in upper third or fifth, becoming grayish white below, apex rounded-obtuse or subtruncate, often exhibiting a delicate, translucent apiculum formed of the mantle-caps:* number of successive whorls of branches mostly 60–120; number of branches in a whorl 12–56: hairs of two forms in separate zones, those of one form consisting of a single, clavate, often curved or somewhat hooked cell rich in chlorophyl and having a maximum diameter about equal to that of the supporting cell, the apex acute, obtuse, or more often apiculate; those of the second form consisting of a somewhat similar though slightly narrower basal cell bearing at its apex one or two earlier caducous, more slender branches, these in turn each bearing 2–4 branches; unicellular hairs or basal cells of the multicellular persisting in the upper third or fifth of the plant, the surface after their fall appearing somewhat shaggy or minutely and irregularly punctate, a cortex scarcely developed: branches of the first order lightly calcified, scarcely coherent; branches of the second order more strongly calcified, irregularly and imperfectly coherent, subfusiform, often somewhat curved or gibbous, broadest (100–150 μ) a little above the middle, tapering to a conico-truncate apex 22–34 μ broad at the insertion of the hair: sporangia strongly calcified, free or coherent in short rows of 2–8, pyriform-obovoid, 180–206 μ long (decalcified and including stalk), 90–102 μ in maximum width, calcareous capsule 25–40 μ thick; spores obovoid, 140–156 μ × 82–94 μ. (PLATE 6, FIGURES 3–12.)

Opposite Current Town, Eleuthera, July 5, 1903. The material collected consists of about thirty individuals.

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* "Kappentheile oder Mantelkappen" of Cramer, Neue Denkschr. Schweiz. Naturf. Ges. **32**: 12. 1890.

Neomeris Cokeri constitutes the third known species of the genus, all of which occur in the West Indian region. The principal diagnostic characters of the three species may be arranged as follows:

Hairs homogeneous; ends of the branches of the second order forming a cortex with distinct facets.
  Plant reaching a height of 3.5 cm.; sporangia spherical or nearly so, strongly calcified but free. 1. *N. dumetosa.*[*]
  Plant reaching a height of 2 cm.; sporangia obovoid-oblong or pyriform-obovoid, about twice as long as broad (not including stalk), strongly coherent laterally by their calcareous capsules, so that the plant in the lower fertile parts appears transversely annulate. 2. *N. annulata.*[†]
Hairs dimorphous, the two forms in different zones; branches of the second order subfusiform, scarcely forming a cortex, surface of the plant after the fall of the hairs somewhat shaggy or minutely and irregularly punctate; sporangia free or coherent in short rows of 2–8. 3. *N. Cokeri.*

Neomeris annulata is not especially uncommon in the West Indian region. The writer has collected specimens in Bermuda, Key West, Florida (two stations) and Porto Rico (three stations). Of what appears to be the true *N. dumetosa*, we have seen only one specimen — the one from Hawaii distributed as *Neomeris dumetosa* by Miss Tilden in American Algae, *no. 445*. *No. 668* of the Phycotheca Boreali-Americana (St. Thomas, *Börgesen*, Jan. 1896) distributed as *Neomeris dumetosa* has, in the two copies seen, the characters of *N. annulata.* The original description of *Neomeris dumetosa*, as given by Lamouroux, with its "bulles conoïdes ou pédiculées, se touchant entre elles tant elles sont nombreuses, mais sans être coalescentes," combined with Cramer's redescription of the original material (collected in the Antilles by Richard) can leave little doubt as to what *Neomeris dumetosa* really is. The type of *Neomeris annulata* came from Mauritius, where it was collected by Colonel Nicolas Pike. The species is not represented in Colonel Pike's herbarium, now in the possession of the New York Botanical Garden, but Count Solms has seen * the original material preserved in the British Museum and his figures drawn from Mauritius specimens would apply very well to the specimens from Bermuda, Porto Rico, and St. Thomas, alluded to above. Solms-Laubach refers Porto Rican material to this species, using the name *Neomeris annulata*, and Cramer refers to the same both Porto Rican and Bermudian specimens, preferring, however, the name *Neomeris Kelleri.*

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[*] NEOMERIS DUMETOSA Lamour. Hist. Polyp. 243. *pl. 7. f. 8.* 1816. Sonder, Alg. Trop. Austral. *pl. 5. f. 8–13.* 1871. J. Ag. Till Alg. Syst. 5 : 147–151. *pl. 2. f. 4–7.* 1887. Cramer, Neue Denkschr. Schweiz. Naturf. Ges. 30 : — (10, 38) *pl. 2. f. 13–15; pl. 3. f. 3.* 1887. Cramer, *op. cit.* 32 : 19. *pl. 1. f. 13.; pl. 2. f. 7, 8.* 1890. De-Toni, Syll. Alg. 1 : 413. 1889. Solms, Ann. Jard. Bot. Buitenzorg, 11 : 70. *pl. 8b. f. 11.* 1893.

[†] NEOMERIS ANNULATA Dickie, Jour. Linn. Soc. 14 : 198. 1874. De-Toni, Syll. Alg. 1 : 414. 1889. Solms, Ann. Jard. Bot. Buitenzorg, 11 : 61–71. *pl. 8. f. 1, 3, 4, 7, 8, 12, 13,* 17. 1893.

Neomeris Kelleri Cramer, Neue Denkschr. Schweiz. Naturf. Ges. 30 :—(3). *pl. 1; pl. 2. f. 1–12; pl. 3. f. 1, 2.* 1887. Cramer, *op. cit.* 32 : 9. *pl. 1. f. 1–12; pl. 2. f. 1–6; pl. 4. f. 15–24.* 1890. De-Toni, Syll. Alg. 1 : 413. 1889.

Neomeris Eruca Farlow; Cramer, Neue Denkschr. Schweiz. Naturf. Ges. 32 : 9, 18, 19. 1890.

The names *Dactylopora Eruca*, *D. digitata*, and *D. Annulus* of Parker and Jones (Ann. and Mag. Nat. Hist. III. 5 : 473, 474. 1860), quoted by Cramer in the synonymy of his *Neomeris Kelleri*, were originally applied simply to calcified spore-masses and fragments of a *Neomeris* from the "East Indian and other tropical seas," and cannot, in our opinion — especially since the discovery of *Neomeris Cokeri* with its peculiar hairs — be safely identified with any definite species, though as between *Neomeris dumetosa* and *N. annulata*, *Dactylopora Eruca* and *D. Annulus* clearly belong with the latter type. The name *Neomeris Eruca* Farlow apparently was first published by Hauck in Engler's Bot. Jahrb. (9 : 469. 1888) but this, so far as the technicalities of publication are concerned, rests on the *Dactylopora Eruca* synonym alone, and is therefore, we believe, of uncertain application.

CYSTOSEIRA MYRICA (Gmel.) Ag.

Gregory Town, Eleuthera.

LIAGORA ANNULATA J. Ag.

Gregory Town, Eleuthera.

Somewhat resembling *Liagora valida* in habit, but clearly distinct — firmer, beautifully annulate from near the base to the partially calcified apices; the apices are rounded-obtuse in fluid-preserved material, but often become attenuate-acuminate on drying. The annulations appear to be due to unequal calcification in well-defined alternating zones.

NEW YORK BOTANICAL GARDEN.

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* Ann. Jard. Bot. Buitenzorg, 11 : 61. 1893.

Explanation of plate 6

Figs. 1 and 2. *Coccocladus occidentalis laxus;* 3–12, *Neomeris Cokeri.*

1. One of the whorled branches of *Coccocladus occidentalis laxus*, with sporangia, × 12.

2. A single sporangium, × 40.

3. *Neomeris Cokeri*, natural size.

4. A single plant, × 8. At the apex, in this individual, is a zone of multicellular hairs, surrounding and concealing the apiculum formed of the mantle-caps; below, are the unicellular hairs, and farther downward, the lime-coated sporangia, isolated, or coherent in short rows.

5. Apical portion of another plant, × 12. The hairs in the apical region are here of the unicellular kind and the apiculum formed of the mantle-caps is conspicuous; below is a zone of multicellular hairs.

6. A fertile primary branch, with branches of the second order, each, in this case, bearing a unicellular hair, × 40. (Decalcified.)

7. A similar fertile primary branch, × 40. (Decalcified.)

8. A fertile primary branch, with branches of the second order, each, in this case, bearing a multicellular hair, × 40. (Decalcified.)

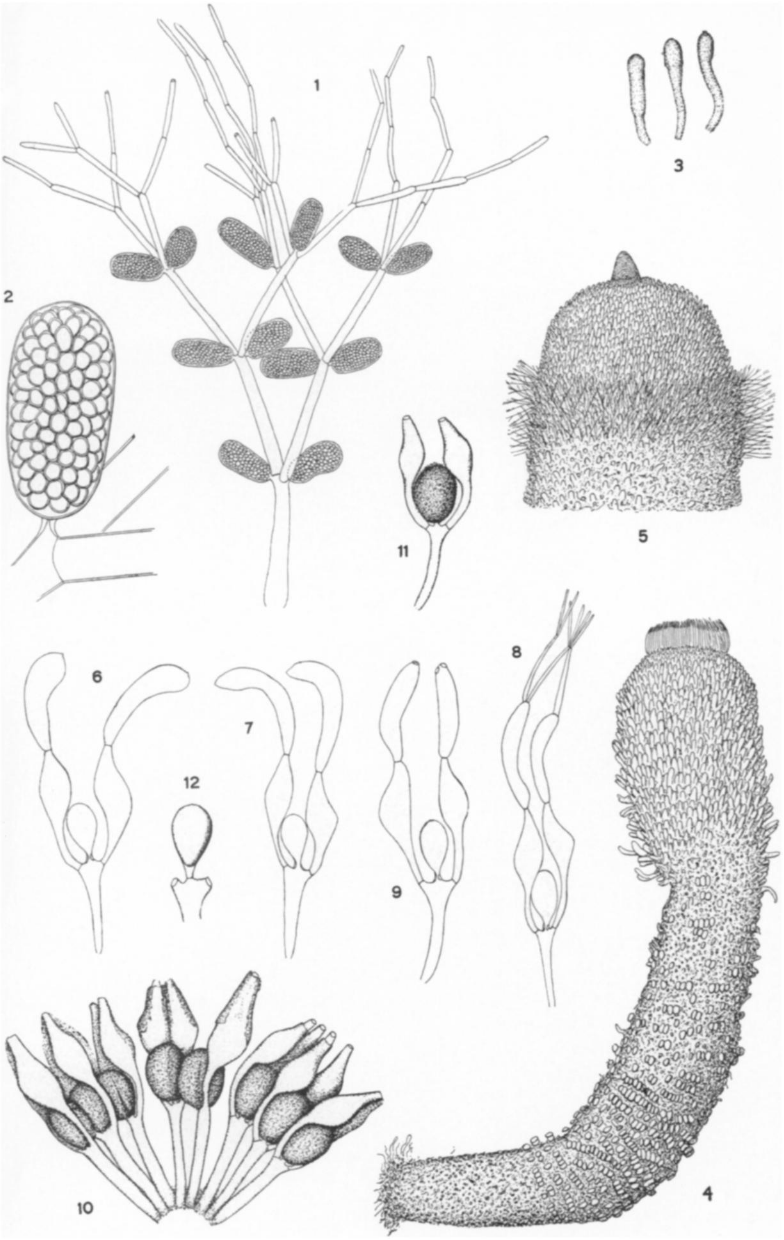
9. The conditions in this figure are similar to those represented in Fig. 8, except that only the basal cells of the multicellular hairs now persist. Scars remain indicating the places of insertion of the hair-segments which have fallen. In this stage the two forms of hairs sometimes resemble each other, but the persisting bases of the multicellular may be recognized by the presence of these scars, which are always entirely wanting on hairs of the unicellular kind.

10. Part of a primary whorl, with sporangia and branches of the second order, × 40, with calcareous coating.

11. A single primary branch, with sporangium and branches of second order, with calcareous coating, × 37.

12. A mature spore, within the sporangium, decalcified, × 53.

The drawings have been made by the writer, with some assistance from Mr. A. Mariolle in preparing them for reproduction.



1, 2 COCCOCLADUS OCCIDENTALIS LAXUS M. A. Howe
3–12 NEOMERIS COKERI M. A. Howe